

**A. BIOGRAPHICAL INFORMATION**

**1. PERSONAL**

R. J. Dwayne Miller  
Professor of Chemistry and Physics  
Director of the Institute for Optical Sciences

Department of Chemistry  
University of Toronto  
80 St. George Street  
Toronto, Ontario M5S 3H6  
(416) 978-1528 (telephone)  
(416) 978-0366 (facsimile)

**2. DEGREES**

1983-1984     Université Joseph Fourier, Laboratoire de Spectrometrie Physique  
                  Postdoctoral Research: Dr. H. P. Trommsdorff  
1978-1983     Stanford University, Ph.D., 1983  
                  Research Director: Professor Michael D. Fayer  
1974-1978     University of Manitoba, B.Sc. Honours, 1978  
                  Research Director: Professor Bryan R. Henry

**3. EMPLOYMENT**

2007-present   University Professor, University of Toronto  
2005-present   Director of the Institute for Optical Sciences, University of Toronto  
1995-present   Professor of Chemistry and Physics, University of Toronto  
1992-1995     Professor of Chemistry and Optics, University of Rochester  
1988-1992     Associate Professor of Chemistry and Optics, University of Rochester  
1984-1988     Assistant Professor of Chemistry, University of Rochester

**4. HONOURS**

*Academic Honours:*

2007           Closs Lecturer, University of Chicago  
2005           Charles A. McDowell Lecturer, University of British Columbia  
2004           Armes Lecturer, University of Manitoba  
2000           Huggins Lecturer, Acadia University  
2000           John Charles Polanyi Lecturer, Canadian Society for Chemistry, Calgary  
1983-1984     NATO Science Fellow  
1978-1983     NSERC Postgraduate Fellowship  
1978           "1967" Science Postgraduate Scholarship  
1978           Chemical Institute of Canada Medal for Excellence  
1977           Allied Chemical Scholarship  
1977           David R. Petrie Scholarship  
1976-1977     Chemical Institute of Canada Award

***Research Awards***

2002	Humboldt Award
2002	Canada Research Chair in Femtoscience
1998	Society of Imaging and Science Technology – Science Award (“Paper of the year”)
1997	Royal Society of Canada Rutherford Medal in Chemistry
1995	NSERC Lumonics Research Chair in Quantum Optics
1992	John Simon Guggenheim Fellow
1988	Camille and Henry Dreyfus Teacher-Scholar Award
1988	Alfred P. Sloan Research Fellow
1987	National Science Foundation Presidential Young Investigator

***Memberships of Distinction***

2007	Editorial Board of the Journal of Chemical Physics
2006	Scientific Advisory Board of LENS (Florence EU Centre)
2004	Board member of the Telluride Science Research Center (Telluride, CO)
2003	Board Chair, Scientists in School
2003	Scientific Director, Advanced Laser Source, Varenne Quebec
2002	Advisory Editorial Board of Chemical Physics Letters
2002	Scientific Advisory Board, Steacie Institute of Molecular Sciences, National Research Council of Canada
2001	Board Member, Scientists in Schools
2000	Fellow of the Chemical Institute of Canada
2000	Board Member of the University of Toronto Faculty Club
1998	Fellow of the Royal Society of Canada
1997	Director of Photonics, Photonics Research Ontario
1997	Senior Fellow of Trinity College
1996	Associate Executive Director of the Ontario Laser and Lightwave Research Centre
1996	Associate Fellow of Massey College, University of Toronto
1996	Advisory Editorial Board of Chemical Physics
1987	Elected Member at Large of the Executive Committee of the American Chemical Society - Regional Chapter

**5. PROFESSIONAL AFFILIATION**

- Member of the Chemical Society of Canada
- Member of the Chemical Institute of Canada
- Member of the American Physical Society
- Member of the Optical Society of America
- Member of the Canadian Association of Physicists

**B. ACADEMIC HISTORY**

**6. A. RESEARCH ENDEAVORS**

Primary research focuses on the use of ultrashort ( $10^{-15}$  sec) nonlinear laser and electron spectroscopies to probe various aspects of chemical reaction dynamics and molecular photophysics in biological systems and interfaces. Key questions being addressed are the

mechanisms for molecular cooperativity in biological systems and the degree of wave function penetration between discrete molecular states and delocalized band states of surfaces. Advances in these areas promises control of biological functions, next generation electronics (nanotechnologies), and theoretical limits to solar energy conversion. Most recent work has focused on the development of femtosecond electron pulse sources to give the first real time view of atomic motions during a structural transition. Major new emphasis will be placed on fully exploiting this new methodology to obtain full structural details of transitions states in chemical and biological processes. This work has been complemented by the development of diffractive optics based nonlinear spectroscopy as a new approach for accessing information on intermolecular forces that are responsible for the dynamic structure of liquids and driving forces for biological structure/function correlations involved in barrier crossings.

## B. PATENTS (partial list)

1. "Laser Clamping Assembly and Method," U.S. Patent No. 6,385,220 (awarded May 7, 2002).
2. "Microstructuring Optical Waveguide Devices with Femtosecond Optical Pulses," Canada Provisional Patent, U.S. patent pending (filed Aug. 2002).
3. "Novel Optical Scheme for Holographic Imaging of Complex Diffractive Elements in Materials," Canadian Patent No. 2,281,039 (awarded November 28, 2006).
4. "Optical Parametric Chirp Pulse Amplification Method and Apparatus for High Power Optical Amplification in the Mid-IR Wavelength Range (1-15  $\mu\text{m}$ )," U.S. Patent pending (filed May 14, 2004).
5. "Hybrid Ultrafast Laser Surgery – Growth Factor Stimulation for Ultra-Precision Surgery with Healing," U.S. Patent pending (filed August 3, 2004).
6. "Method and Apparatus for High Power Optical Amplification in the Infrared Wavelength Range (0.7-20  $\mu\text{m}$ )," U.S. and P.C.T. Patents pending (filed May 16, 2005).
7. "Laser Selective Cutting by Impulsive Heat Deposition in the IR Wavelength Range for Direct-Drive Ablation," U.S. and P.C.T. Patents pending (filed December 30, 2005).
8. "Laser System for Generation of High-Power Sub-Nanosecond Pulses with Controllable Wavelengths in 2-15  $\mu\text{m}$  Region," U.S. and P.C.T. Patents pending (filed January 10, 2006).
9. "Laser Amplifiers with High Gain and Small Thermal Aberrations," U.S. and P.C.T. Patents pending (filed January 10, 2006).
10. "High Power UV Generation through the Elimination of Surface Heating Effects", US. Provisional Patent (filed April 2006).

## C. SCHOLARLY AND PROFESSIONAL WORK

### Publications and Presentations (last 5 years)

	Published / In Press	Submitted
Refereed Papers	40	1
Invited Presentations	165	

## D. TRAINING

**Master's Students** – Current: 2; Trained: 16

**Ph.D. Graduate Students** – Current: 10; Trained: 24

**Postdoctoral Fellows** – Current: 11; Trained: 30

Former students and fellows currently hold faculty or senior scientist positions at Yale University, University of Michigan (2), Universität Kaiserslautern, University of Regina, Wellesley College, University of Scranton, Norfolk University, McGill University, University of Wisconsin-Milwaukee, NIST, LLNL, TRW, NRC, Rohm and Haus, and the Institute for Optical Sciences (Toronto).

## E. OTHER RELEVANT INFORMATION

### **PROFESSIONAL ACTIVITIES (partial list)**

- Guest Editor for Chemical Physics (1995)
- Advisory Editorial Board of Chemical Physics (1996-present)
- Advisory Editorial Board of Chemical Physics Letters (2000-present)
- Board Member of the Faculty Club (2000 - present)
- Board Member of Scientists in Schools (2001-2006)
- Program Chair for Ultrafast Phenomena XIII (2002)
- Program Committee for International Conference on Photothermal and Photoacoustic Phenomena (2002)
- NSERC Reallocation Committee for Chemistry (2002)
- Selection Council for Canada Research Chairs (2002)
- Member of the International Organizing Committee for the Coherent Multidimensional Spectroscopy conference (2002-present)
- Scientific Advisory Board of the Staacie Institute for Molecular Science, National Research Council of Canada (2002-2005)
- International Advisory Committee for Coherent Multidimensional Spectroscopy
- NSERC Selection Committee for AGENO Program (2003)
- Co-chair and principal organizer of the biannual Protein Dynamics Workshop held in Telluride, CO (July 2003)
- Member of the International Organizing Committee for the Time-Resolved Vibrational Spectroscopy (TRVS) conference (2003-present)
- Board Chair of Scientists in Schools (2004)
- Advisory Chair for Ultrafast Phenomena XIV (2004)
- Board Member of the Telluride Science Research Center, Telluride, CO (2004-2007)
- Co-Scientific Director of Advanced Laser Light Source, Varenne Quebec
- Member of the Scientific Council of the European Laboratory for Non Linear Spectroscopy (LENS)
- General Chair for Ultrafast Phenomena 2006
- Editorial Board of the Journal of Chemical Physics (2007- present)